

# HP BladeSystem p-Class System Overview and Planning



Introduction .....	3
Executive summary .....	3
HP BladeSystem modular architecture key benefits .....	4
HP BladeSystem manageability key benefits .....	5
HP BladeSystem overview .....	6
Hardware components .....	9
ProLiant BL20p and BL25p series server blades .....	10
ProLiant BL30p and BL35p series server blades .....	11
ProLiant BL40p and BL45p Server Blades .....	12
ProLiant BL p-Class server blade SAN connectivity .....	14
FC connectivity with ProLiant BL20p, BL25p, BL30p, BL35p, and BL45p series server blades .....	14
FC connectivity with ProLiant BL40p server blades .....	16
Specific requirements for attaching ProLiant BL30p and ProLiant BL35p Server Blade to FC SANs .....	16
HP BladeSystem p-Class Server Blade Enclosure .....	17
HP BladeSystem p-Class Blade Sleeve .....	19
HP BladeSystem p-Class network interconnect options .....	20
Cisco Gigabit Ethernet Switch Module for HP BladeSystem p-Class .....	21
ProLiant BL p-Class GbE2 Interconnect Switch .....	22
ProLiant BL p-Class GbE Interconnect Switch .....	23
ProLiant BL p-Class RJ-45 Patch Panel .....	25
ProLiant BL p-Class RJ-45 Patch Panel 2 .....	26
HP BladeSystem p-Class power subsystem .....	27
Enclosure-based power .....	27
Rack-centralized power .....	27
Power supplies .....	27
Power distribution .....	28
HP BladeSystem p-Class 1U and 3U power subsystem features .....	30

HP BladeSystem p-Class Diagnostic Station .....	31
HP BladeSystem p-Class diagnostic and local I/O cables .....	32
HP BladeSystem Management Software overview .....	33
HP BladeSystem p-Class operating system installation options.....	34
Operating system support .....	34
HP ProLiant Essentials Rapid Deployment Pack.....	35
HP Systems Insight Manager .....	35
Integrated Lights-Out Advanced Edition.....	36
Smart Array RAID controllers .....	36
HP BladeSystem p-Class Interconnect Switch Management.....	37
Planning for a HP BladeSystem p-Class installation .....	38
HP BladeSystem p-Class Sizing Utility .....	38
Required input power .....	39
Facility DC power connection .....	40
Power phases and 3U power supply enclosures .....	40
AC connectors for the 3U power enclosure.....	41
Deployment considerations: HP BladeSystem p-Class network interconnects .....	42
Deployment considerations: ProLiant BL p-Class RJ-45 Patch Panel and Patch Panel 2 .....	42
Deployment considerations: ProLiant BL p-Class GbE2 Interconnect Switches .....	42
Deployment considerations: ProLiant BL p-Class GbE Interconnect Switches .....	44
HP BladeSystem rack specifications .....	44
Server Blade Quantity.....	45
Configuring server blade options .....	45
HP BladeSystem server blade enclosures.....	45
3U power distribution .....	45
Site recommendations.....	46
Power requirements .....	46
Cooling and airflow .....	46
Total weight .....	46
Total floor space .....	47
System installation planning guides.....	47
For more information.....	47

# Introduction

This white paper provides an overview of the HP BladeSystem p-Class solution. This solution includes:

- Server blades
- Server blade enclosures
- Network interconnect options
- Power subsystem components
- Management tools

In addition to this document, HP recommends referring to the *HP BladeSystem Best Practices Guide* and the *HP BladeSystem Common Procedures Guide* when planning and setting up an HP BladeSystem solution. The *HP BladeSystem Best Practices Guide* and the *HP BladeSystem Common Procedures Guide* include the instructions, best practices, helpful hints, and suggestions for setting up and configuring the solution and the tools needed for common system management tasks such as deployment, configuration, and monitoring. The *HP BladeSystem Best Practices Guide* and the *HP BladeSystem Common Procedures Guide* are available on the HP website, <http://h18000.www.hp.com/go/bladesystem/>

## Executive summary

The HP BladeSystem p-Class solution consists of server blades, server blade enclosures, network interconnect options, a power subsystem, and management tools that enable adaptive computing and is optimized for rapid deployment. HP BladeSystem server blades are designed for the high performance and high availability that you have come to expect from HP ProLiant industry-standard servers. The HP BladeSystem solution protects your investment with a modular portfolio that supports many different environments and workloads including:

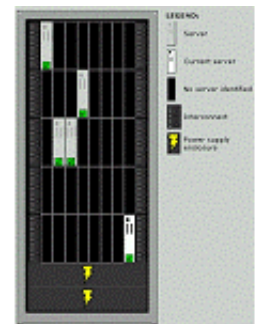
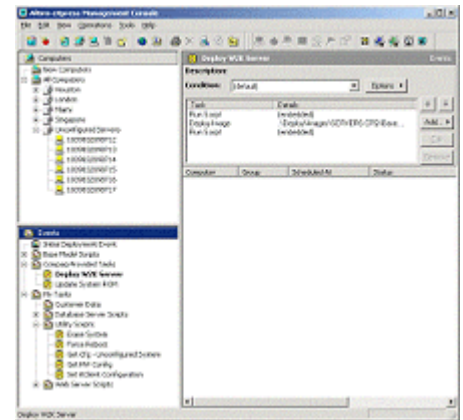
- ProLiant BL20p and BL25p Server Blades—Ideal for multi-tiered enterprise data centers. The ProLiant BL20p and BL25p Server Blades feature a dual-processor-capable design, high-performance memory, an integrated SmartArray RAID controller, Universal hot-plug SCSI hard drives, Integrated Lights-Out (iLO) Advanced functionality, up to four general-purpose Gigabit Ethernet network controllers, and optional Fibre Channel (FC) SAN connectivity.
- ProLiant BL30p and BL35p Server Blades—Ideal for high-performance technical computing and enterprise datacenter environments that use external storage. The ProLiant BL30p and BL35p Server Blades feature a dual-processor-capable design optimized for maximum server density. Server blades feature high-performance memory, iLO Advanced functionality, two general-purpose Gigabit Ethernet network controllers, and optional FC SAN connectivity.
- ProLiant BL40p and BL45p Server Blades—Designed to power back-end and mission-critical applications. The ProLiant BL40p and BL45p Server Blades support up to four processors, maximum performance DDR memory, integrated SmartArray RAID controller, Universal hot-plug SCSI hard drives, iLO Advanced functionality, four (BL45p) or five (BL40p) general-purpose Gigabit Ethernet network controllers, and optional FC SAN connectivity.

## HP BladeSystem modular architecture key benefits

- Rapid deployment/redeployment saves valuable time
  - Server blades and interconnect switches can be installed and ready for immediate automated provisioning
  - Easy access to most pluggable components from the front of the rack, including server blades, hot-plug hard drives, and interconnect options
  - Easily add server blade capacity as needed without disrupting the system
- Innovative design dramatically cuts network and power cables compared to traditional servers
  - As few as one network cable for as many as 16 server blades using the interconnect switch options
  - Designed for headless management, eliminating the need for keyboard, video, and mouse cables for each server and a KVM switch infrastructure
  - Rack-centralized power subsystem eliminates individual server power cables as well as the clutter and cost of power distribution units (PDUs)
  - Modular interconnect design enables server blades and interconnect options to be rapidly added and replaced without re-cabling Ethernet and FC connections
  - Server blade management module on enhanced server blade enclosures provides a single network cable connection for managing up to 16 server blades simultaneously
- Designed to protect your investment
  - New HP BladeSystem p-Class 1U Power Enclosure is ideal for small blade deployments such as in remote office locations and is compatible with all server blades, networking, storage options.
  - Broad server blade portfolio enables complete, end-to-end solutions, including enterprise applications and high-performance computing clusters using modular building blocks.
  - Server blades and network interconnect options can be mixed in the same blade enclosure while operating independently and running different operating systems and applications.
  - HP BladeSystem enclosures may be installed in HP, telco, and third-party racks.
  - HP BladeSystem enclosures may share racks with traditional servers, networking, and storage devices.
  - Power and network interconnect options support all current and future ProLiant BL p-Class server blades, including the latest AMD Opteron-based server blade models.
  - FC SAN connectivity options support HP and select third party storage products.
- Availability features to provide peace of mind
  - Redundant, hot-plug power supplies
  - Hot-plug SCSI hard drives and integrated RAID controller on some blade models
  - Dual-port FC SAN connectivity
  - Multiple general-purpose NICs on each server blade for redundant connections to data networks
  - Redundant ROM on each server blade
  - Redundant pairs of hot-plug interconnect switch options

## HP BladeSystem manageability key benefits

- Quickly configure both server blades and interconnect switches from a centralized deployment console using HP ProLiant Essentials Rapid Deployment Pack (RDP).
  - Configure tens to hundreds of server blades simultaneously in a fraction of the time required to configure conventional servers using multicasting
  - Automatically restore the role of a previous blade to a new server blade
  - Integrate interconnect switch scripts in RDP for deployment interconnect switches as well as server blades
- Leverage IT personnel by managing a larger number of server blades both locally and remotely with less time and effort.
  - Preboot eXecution Environment (PXE) technology enhances remote access by installing and configuring operating systems to boot over a network.
  - iLO Advanced functionality ships standard on every server blade, including full remote console virtual media (diskette and CD-ROM) capabilities.
  - Fully integrates with HP Systems Insight Manager (HP SIM) so you can manage ProLiant blades and traditional servers with the same tools.
- Take greater control of HP BladeSystem environments with HP SIM.
  - HP SIM is the easy-to-use, flexible, scalable, and secure solution for managing HP servers and client devices by providing rapid access to detailed fault and performance information.
  - HP SIM provides visualization of server blades and interconnect switches at both enclosure and at rack levels for better awareness and control of all blade system components.



HP BladeSystem rack visualization in HP SIM with physical detail view

# HP BladeSystem overview

Figure 1 shows an HP BladeSystem p-Class Server Blade Enclosure.

Figure 1. HP BladeSystem standard server blade enclosure

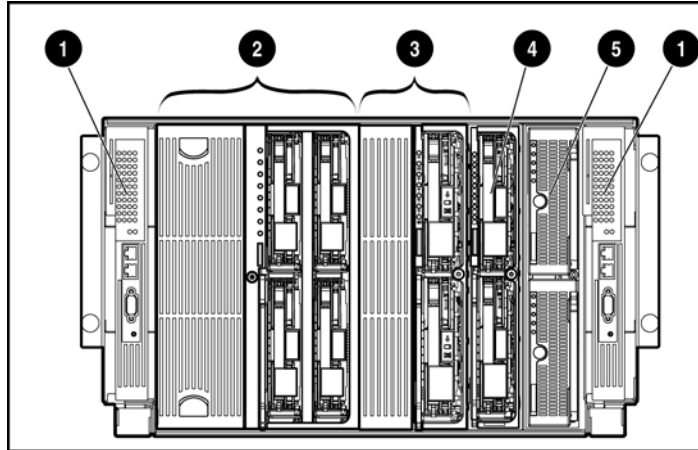


Table 1. Server Blade Components

Item	Description
1	HP BladeSystem p-Class Interconnects (2) in a server blade enclosure (Interconnect Switch shown)
2	ProLiant BL40p Server Blade
3	ProLiant BL45p Server Blade
4	ProLiant BL20p or BL25p Server Blades
5	ProLiant BL30p or BL35p Server Blades

Figure 2 shows an HP BladeSystem p-Class 1U Power Enclosure installation.

Figure 2. HP BladeSystem p-Class Enhanced Server Blade Enclosure and 1U Power Enclosure

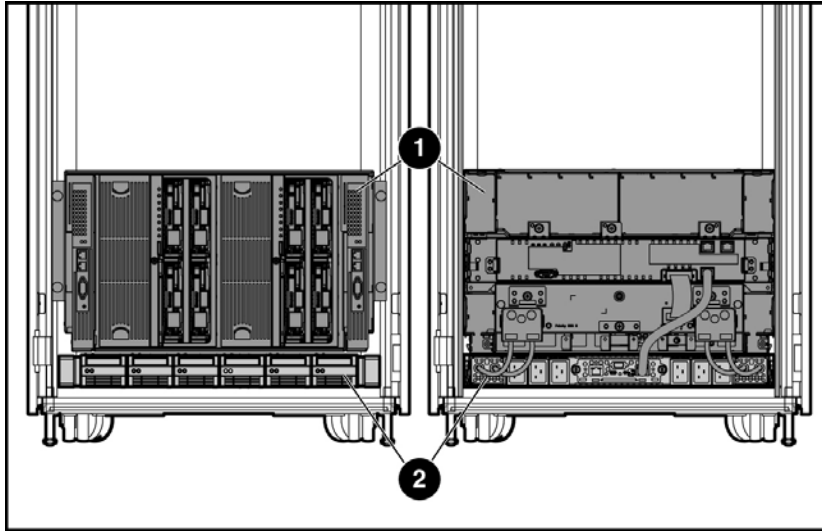


Table 2. HP BladeSystem p-Class Enhanced Server Blade Enclosure and 1U Power Enclosure

Item	Description
1	Enhanced server blade enclosure
2	1U power enclosure with power supplies

Figure 3 shows an HP BladeSystem p-Class 3U power subsystem installed in a 42U rack.

Figure 3. HP BladeSystem 3U Power Enclosures and power distribution components in a 42U rack.

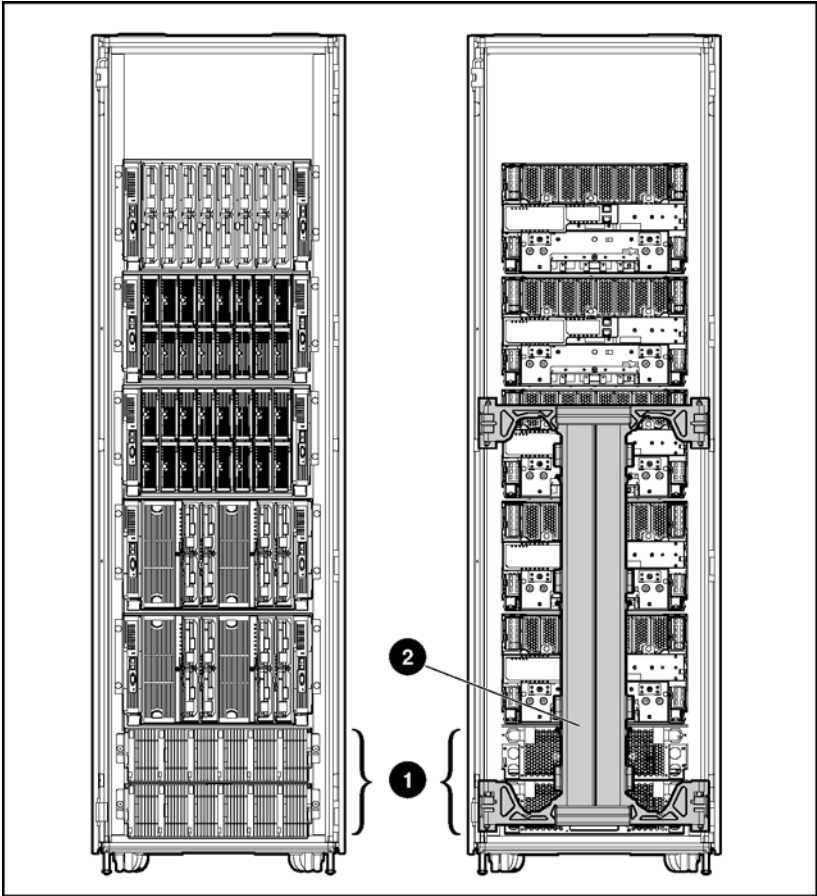


Table 3. Power Subsystem Components

Item	Description
1	Hot-plug power supplies in two 3U power enclosures
2	Power distribution (scalable bus bars shown)



# Hardware components

The HP BladeSystem p-Class solution consists of the following:

- Server blades
- Server blade enclosures
- Network interconnects
- Power subsystem

Table 4. HP BladeSystem Required Components

Required Components	Function
Server blade	Server blades contain one or more processors, memory, internal and external storage options, and integrated management. For FC connectivity, server blades must also be configured with FC card or FC HBA options. ProLiant BL30p and ProLiant BL35p Server Blades require a p-Class sleeve for mounting in the enhanced server blade enclosure.
Server blade enclosure	<p>HP BladeSystem p-Class enclosures hold server blades and network interconnect options. Combinations of different server blades are supported in the same blade enclosure.</p> <p>Each enclosure supports a pair of interconnects for network cable management. The enhanced server blade enclosure also provides a single Ethernet port for connecting to the iLO interface of every installed server blade.</p> <p>Some server blade models are supported only in the enhanced server blade enclosure. Refer to the enclosure compatibility matrix on the HP website, <a href="http://h18004.www1.hp.com/products/blade/components/Compatibility-Matrix.html">http://h18004.www1.hp.com/products/blade/components/Compatibility-Matrix.html</a></p>
Network interconnects	<p>HP BladeSystem p-Class interconnects pass the network adapter (NIC) signals from the server blades to external networks. Several options are available:</p> <ul style="list-style-type: none"><li>• Patch Panel interconnects route each NIC signal individually from the server blades to the customer network.</li><li>• Interconnect switches consolidate the server blade NIC connections to just a few uplinks, reducing the number of cables needed to connect the solution to your network.</li></ul> <p>Both patch panel and interconnect switches are available with or without FC pass-through capability.</p>
Power enclosure with power supplies (Not needed if using facility -48 VDC ±10%)	<p>The HP BladeSystem p-Class system offers two power enclosure options:</p> <ul style="list-style-type: none"><li>• The 1U power enclosure provides redundant power for a single server blade enclosure. It is ideal for remote offices, small businesses, or environments that do not have three-phase power available.</li><li>• The 3U power enclosure and power distribution components provide redundant power for multiple server blade enclosures. This solution is ideal for datacenter rack deployment. The 3U power enclosures are available in single-phase and three-phase models.</li></ul>
Power distribution (used only with 3U power enclosures)	<p>Power is carried from the 3U power enclosure(s) to the server blade enclosure(s) through bus.</p> <p>Bus bars are available in mini and scalable versions depending on the number of server blade enclosures being deployed.</p>
<b>Note:</b> Power requirements for an HP BladeSystem p-Class solution: 200 V to 240 VAC, 30 A or facility DC -48V ±10%	

## ProLiant BL20p and BL25p series server blades

The ProLiant BL20p and BL25p series Server Blades are ideal for infrastructure and enterprise applications, including:

- Web
- E-commerce
- Server-based computing
- AV and streaming media
- Messaging front-end and mobility
- Small database

Figure 4. ProLiant BL20p G3 Server Blade

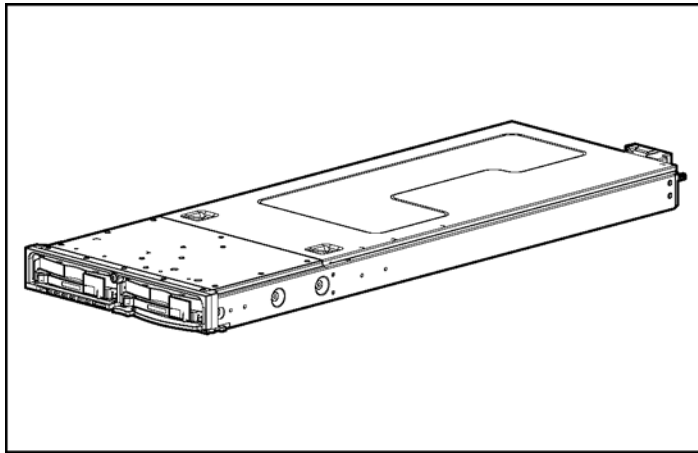


Table 5. Features of the ProLiant BL20p G3 and ProLiant BL25p Server Blades

	ProLiant BL20p G3 Server Blade	ProLiant BL25p Server Blade
<b>Processor</b>	Up to two Intel® Xeon® processors	Up to two AMD Opteron™ 200 Series processors
<b>Internal storage</b>	Up to two universal hot-plug SCSI hard drives connected to the server through a SCSI Smart Array 6i Controller provide up to 600 GB capacity	
<b>Memory</b>	Four DIMM slots enable installation of up to 8 GB of PC3200 DDR2, ECC, Registered SDRAM. The memory is 2x1 interleaved for added performance.	Eight DIMM slots enable installation of up to 16 GB of PC3200 DDR, ECC, Registered SDRAM. The memory is 2x1 interleaved for added performance.
<b>NICs</b>	Four general-purpose Gigabit PCI-X 10/100/1000T NICs with Wake-on LAN (WOL) plus one 10/100T NIC dedicated to iLO. The four general purpose NC-Series NICs support PXE and HP NIC teaming.	
<b>LEDs</b>	LEDs are provided to indicate the following: <ul style="list-style-type: none"><li>- Power</li><li>- NIC link and activity</li><li>- Server blade health</li><li>- Unit identification</li></ul>	
<b>Density</b>	Up to eight server blades fit in a 6U server blade enclosure.	

## ProLiant BL30p and BL35p series server blades

The ProLiant BL30p and BL35p Server Blades are ideal for enterprise and high-performance computing applications, including:

- High-performance technical computing applications
- Web
- E-commerce
- Server-based computing
- Messaging front-end

Figure 5. ProLiant BL30p Server Blade

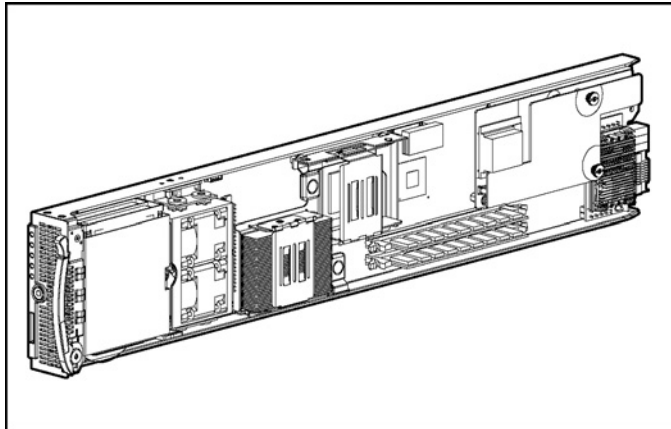


Table 6. Features of the ProLiant BL30p and ProLiant BL35p Server Blades

	ProLiant BL30p Server Blade	ProLiant BL35p Server Blade
<b>Processor</b>	Up to two Intel Xeon processors	Up to two AMD Opteron™ 200 Series processors per server blade. Lower power consumption per server enables use of more server blades for a given power consumption
<b>Internal storage</b>	Up to two small form factor (SFF) ATA hard drives provide up to 120 GB capacity.	
<b>Memory</b>	Two DIMM slots enable installation of up to 4 GB of PC2100 DDR, ECC, Registered SDRAM. The memory is 2x1 interleaved for added performance. Single DIMM non-interleaved memory configurations are also supported for added flexibility.	Four DIMM slots enable installation of up to 8 GB of PC3200, ECC, Registered SDRAM. The memory is 2x1 interleaved for added performance.
<b>NICs</b>	Two general-purpose NC7781 Gigabit PCI-X 10/100/1000T NICs with WOL plus one 10/100T NIC dedicated to iLO. The two general purpose NC-Series NICs support PXE and HP NIC teaming.	
<b>LEDs</b>	LEDs are provided to indicate the following: <ul style="list-style-type: none"><li>- Power</li><li>- NIC link and activity</li><li>- Server blade health</li><li>- Unit identification</li></ul>	
<b>Density</b>	Up to 16 server blades fit in a 6U server blade enclosure.	

## ProLiant BL40p and BL45p Server Blades

The ProLiant BL40p Server Blade is ideal for the following applications:

- Medium to large enterprise databases
  - Messaging and collaboration
  - IPC Clustering/Failover Clustering
  - E-commerce
  - Server consolidation
  - Enterprise Resource Planning (ERP)
  - Customer Relationship Management (CRM)
  - Data Warehousing
  - Large file/print or domain controllers
- 

Figure 6. ProLiant BL40p Server Blade

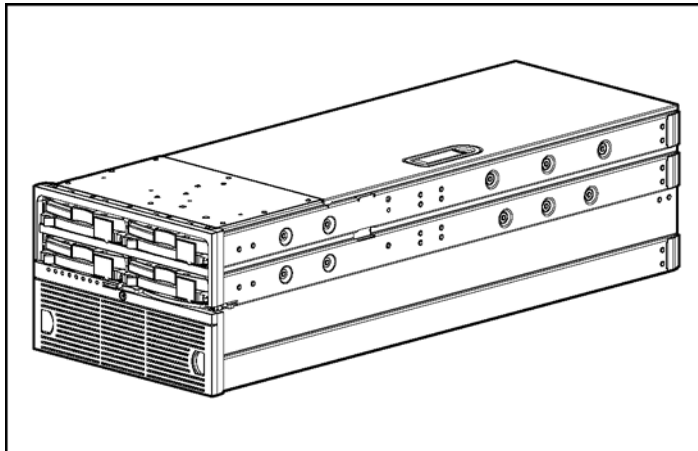


Figure 7. ProLiant BL45p Server Blade

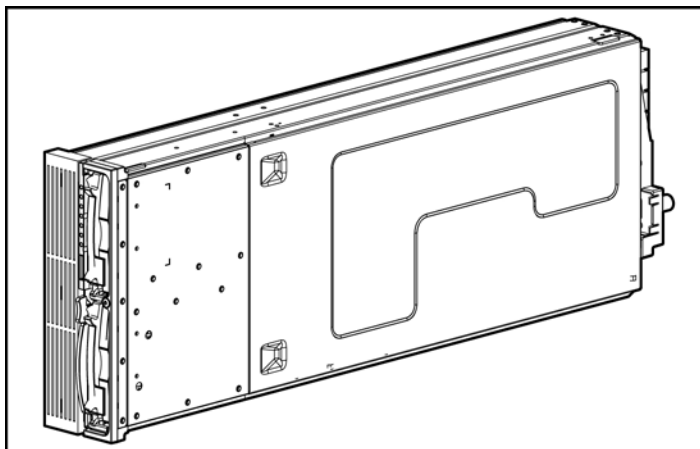


Table 7. Features of the ProLiant BL40p and ProLiant BL45p Server Blade

	ProLiant BL40p Server Blade	ProLiant BL45p Server Blade
<b>Processor</b>	Up to four Intel Xeon processors	Up to four AMD Opteron 800 Series processors
<b>Internal storage</b>	Up to four universal hot-plug SCSI hard drives connected to the server through a Smart Array 5i controller with Battery Backed Write Cache Enabler provide up to 1200 GB capacity	Up to two universal hot-plug SCSI hard drives connected to the server through a Smart Array 6i controller with Battery Backed Write Cache Enabler provide up to 600 GB capacity
<b>Memory</b>	Six DIMM slots enable installation of up to 12 GB of PC2100 DDR, ECC, Registered SDRAM. The memory is 2x1 interleaved for added performance.	Sixteen DIMM slots enable installation of up to 32 GB of PC3200 DDR, ECC, Registered SDRAM. The memory is 2x1 interleaved for added performance.
<b>NICs</b>	Five general-purpose PCI-X 10/100/1000T NICs with WOL plus one 10/100T NIC dedicated to iLO. The five general purpose NC-Series NICs support PXE and HP NIC teaming.	Four general-purpose PCI-X 10/100/1000T NICs with WOL plus one 10/100T NIC dedicated to iLO. All five general purpose NC-Series NICs support PXE and HP NIC teaming.
<b>Expansion</b>	Two PCI-X slots for redundant FC HBAs and certain Smart Array controllers	No expansion slots, FC connectivity supported with a dual-port Fibre Channel adapter option
<b>LEDs</b>	LEDs are provided to indicate the following: <ul style="list-style-type: none"> <li>- Power</li> <li>- NIC link and activity</li> <li>- Server blade health</li> <li>- Unit identification</li> </ul>	
<b>Density</b>	Up to two server blades fit in a 6U server blade enclosure.	Up to four server blades fit in a 6U server blade enclosure.

## ProLiant BL p-Class server blade SAN connectivity

The ProLiant BL p-Class server blades are optimized for HP StorageWorks arrays, and can attach to select third-party SAN solutions. In addition, the server blades can integrate with "fused" NAS and SAN configurations, providing the ability to work in file and block environments seamlessly. HP StorageWorks arrays include:

- StorageWorks MSA 1000
- StorageWorks Enterprise Virtual Array (EVA)
- StorageWorks EMA/MA arrays
- StorageWorks XP

Select Hitachi and EMC models are compatible.

All StorageWorks models listed support SecurePath for multi-path functionality.

All ProLiant server blades support redundant FC SAN connections. With the exception of the ProLiant BL40p Server Blade, all BL p-Class server blades support dual port FC adapter options. The ProLiant BL40p Server Blade has two 64-bit, 100-MHz PCI-X slots that enable redundant FC SAN connectivity using standard host-bus adapter cards.

### **FC connectivity with ProLiant BL20p, BL25p, BL30p, BL35p, and BL45p series server blades**

FC signals are routed from the configured server blade through the blade enclosure backplane to the interconnect modules. Optical transceivers added to the interconnect modules provide connectivity to the external fabric.

For FC SAN connectivity with ProLiant BL20p, BL25p, BL30p, BL35p, and BL45p series server blades, an interconnect kit options with FC pass-through capability is required. Both the ProLiant BL p-Class RJ-45 Patch Panel 2 and the ProLiant BL p-Class GbE2 Interconnect Switch with the GbE2 Storage Connectivity Kit option provide FC SAN pass-through capability.

The dual port FC adapter option kits each include two SFF transceivers with LC connectors. These SFF transceivers are installed in the RJ-45 Patch Panel 2 transceiver slots. The SFF transceivers are universal and can be used with the RJ-45 Patch Panel 2, the GbE2 Interconnect Switch, or Cisco Gigabit Ethernet Switch Module (CGESM) (with GbE2 Storage Connectivity Kit).

Refer to the QuickSpecs for your specific model of server blade to ensure that you are using the correct dual port FC adapter option kit. Each server blade model has a unique FC adapter option kit. Visit the HP website at <http://www.hp.com/go/bladesystem> for the server blade QuickSpecs.

Figure 8. BL20p Dual Port FC Mezzanine Card (installed)

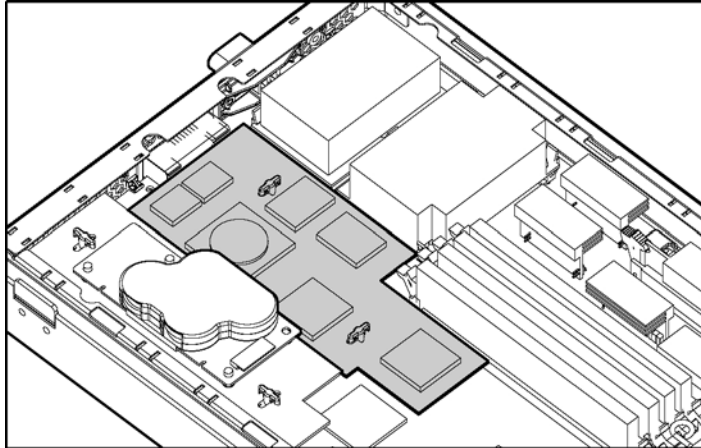


Figure 9. BL25p/BL45p Dual Port FC Adapter

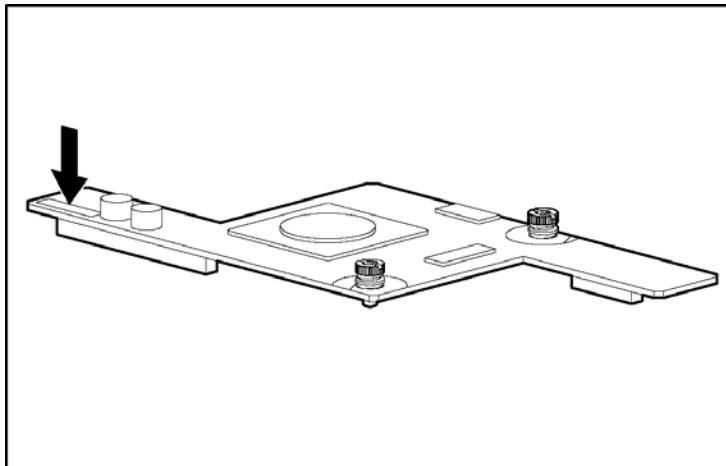
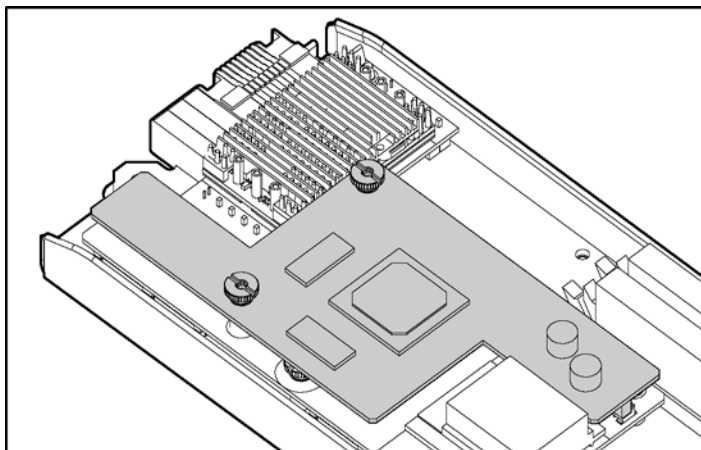


Figure 10. The BL30p/BL35p Dual Port FC Adapter (installed)



### FC connectivity with ProLiant BL40p Server Blades

ProLiant BL40p Server Blades have two external PCI-X slots for use with standard FC HBAs. When configuring ProLiant BL40p Server Blades with FC HBAs, the FC signals are not routed through the signal backplane. Refer to the documentation included with the ProLiant BL40p Server Blade for details.

Figure 11. RJ-45 Patch Panel 2 installed in a server blade enclosure with ProLiant BL40p Server Blades and FC option

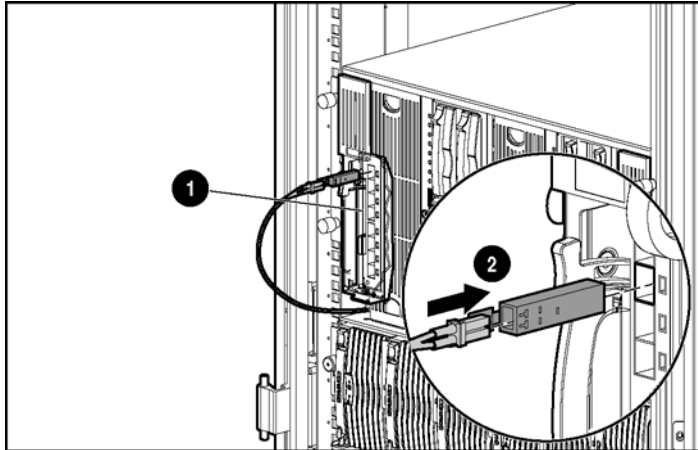


Table 8. Enclosure Components

Component	Description
1	RJ-45 Patch Panel 2
2	SFF transceiver

### Specific requirements for attaching ProLiant BL30p and ProLiant BL35p Server Blade to FC SANs

The ProLiant BL30p/BL35p Dual Port FC Adapter Option is based on the Logic ISP2312 chipset. This chipset carries forward all the features of the ProLiant BL20p G3, ProLiant BL25p, and ProLiant BL45p Dual Port FC Mezzanine Cards and is an industry standard solution. The features of the Dual Port FC Adapter include:

- RDP scripted installation for Microsoft® Windows® and Linux
- Boot capability from SAN disk or LUN
- Blade bay to FC switch compatibility established by the server blade
- High availability through redundant paths

The ProLiant BL30p/BL35p FC Adapter has a different subvendor ID than the ProLiant BL20p G3, ProLiant BL25p, and ProLiant BL45p Dual Port FC Mezzanine Cards. Because the Windows driver is subvendor ID sensitive, a new backward compatible driver was introduced with the ProLiant BL30p and the ProLiant BL35p Server Blades. Linux drivers are not subvendor ID sensitive, so the currently available Linux drivers are compatible.



FC port aggregation is required to accommodate the increased number of server FC HBA ports and to maintain compatibility with the available enclosure backplane signals and interconnect ports. The p-Class sleeve aggregates the four paths from two ProLiant BL30p or ProLiant BL35p Server Blades into two physical paths. This innovative port aggregation technology enables up to 16 physical FC ports from the Patch Panel 2, GbE2 Interconnect Switch, or Cisco Gigabit Ethernet Switch Module to connect directly to the customer external FC SAN switch. ProLiant BL30p and ProLiant BL35p FC implementations require the FC SAN switch to support FC-AL public loop login. With few exceptions, notably McData core switches, most FC switches provide this support. All Brocade SAN switches and most Cisco SAN devices support this feature.

**NOTE:** The FC LED on the Patch Panel 2 or GbE2 Interconnect Switch does not display a live link when using the enhanced server blade enclosure. Port activity information can be obtained from the FC SAN switch or by using QLogic SANsurfer Blade Management software.

## HP BladeSystem p-Class Server Blade Enclosure

ProLiant BL p-Class server blades and network interconnects are housed in a 6U server blade enclosure. The blades slide into the blade enclosure backplanes for power and network connections.

Each blade enclosure has eight server blade bays in the center of the enclosure and two interconnect bays at each end. The two interconnect bays are populated with either patch panel interconnects (for direct signal pass-through) or interconnect switches (for network cable reduction). The middle eight bays support server blades.

The two types of server blade enclosures are: standard server blade enclosures and enhanced server blade enclosures. Some server blade models are supported only in enhanced server blade enclosures. For details, refer to the enclosure compatibility matrix at

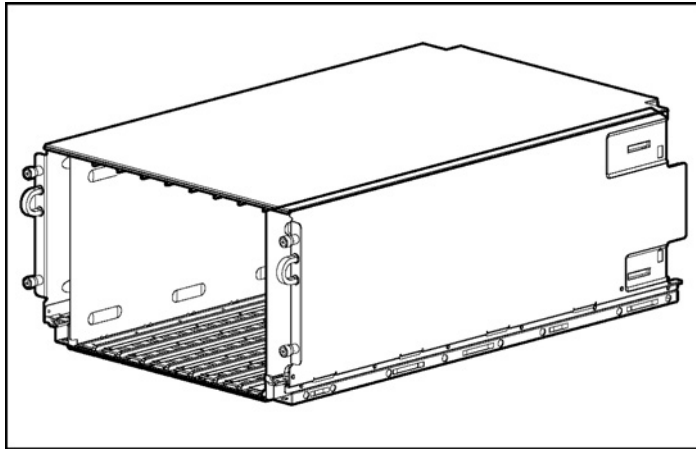
<http://www.hp.com/go/bladeSystem/enclosure/compatibility>

The enhanced server blade enclosure provides the following:

- A server blade management module that simplifies setup and management by:
  - A single physical iLO port for all installed server blades that provides up to 16:1 management cabling consolidation
  - Static IP Bay Configuration for automated configuration of iLO addresses
- Support for all ProLiant BL30p and ProLiant BL35p Server Blades, as well as support for all current and future ProLiant BL20p, ProLiant BL25p, ProLiant BL40p, and ProLiant BL45p series server blades
- Support for all current and future network interconnect options, including the new CGESMs

Figure 12 is a front view of the HP BladeSystem p-Class Blade Enclosure.

Figure 12. Server blade enclosure front view

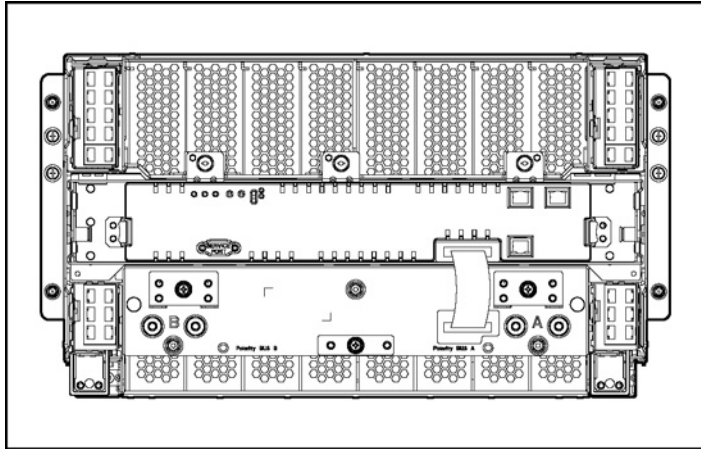


Features of the server blade enclosure include:

- Management communication—The server blade management module reports thermal, power, and protection fuse events to all server blades in the blade enclosure. The management module also facilitates power sharing across enclosures and provides asset and inventory information. On enhanced server blade enclosures, the server blade management module provides a single RJ-45 connector for accessing all installed server blade iLO interfaces. This feature greatly reduces the number of network cables needed for management.
- Availability—The server blade management module is hot-plug and can easily be replaced without interruption to server blades or interconnects. Both electrical and mechanical fuses in the backplane power feed to each bay protect the power backplane from possible electrical damage.
- Toolless installation—Easily installed with spring-loaded rack rails and thumbscrews. Rack rails are common between the server blade enclosure and the power enclosure.
- Toolless serviceability—Power backplane, data backplane, and server blade management module are serviceable without tools and without removing the server blades and interconnects from the enclosure or removing the blade enclosure from the rack.

Figure 13 is a rear view of the HP BladeSystem p-Class Enhanced Server Blade Enclosure.

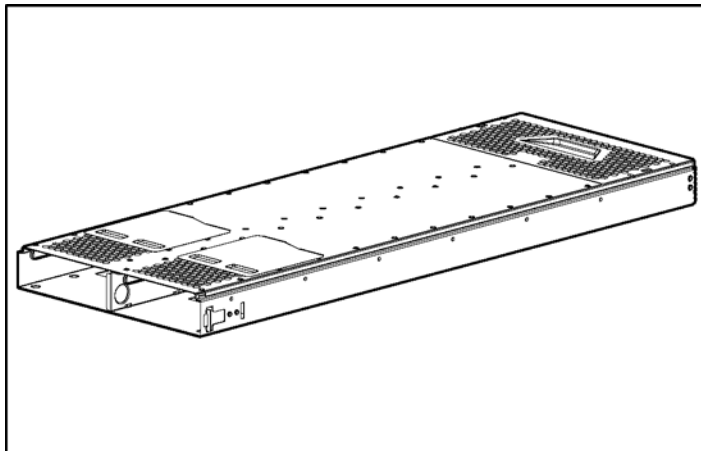
Figure 13. Enhanced server blade enclosure rear view



## HP BladeSystem p-Class Blade Sleeve

The HP BladeSystem p-Class Sleeve is required to support ProLiant BL30p and ProLiant BL35p Server Blades in the enhanced server blade enclosure. The sleeve is for use with these server blades only.

Figure 14. HP BladeSystem p-Class Blade Sleeve



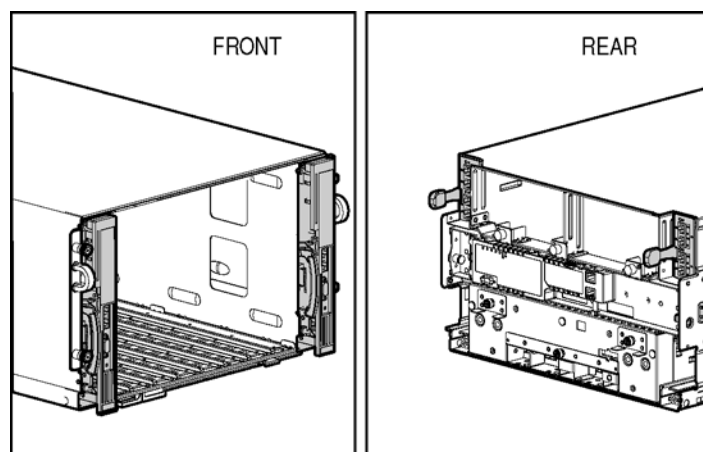
Features of the HP BladeSystem p-Class Blade Sleeve include:

- Holds up to two ProLiant BL30p or ProLiant BL35p Server Blades in any combination
- Installs into any of the eight blade bays in an enhanced server blade enclosure

## HP BladeSystem p-Class network interconnect options

Each server blade enclosure must be configured with a pair of network interconnects. These interconnects slide into the front of the blade enclosure and collect Ethernet and FC (except ProLiant BL40p Server Blades) signals from all the installed server blades.

Figure 15. HP BladeSystem p-Class Enclosure interconnect locations



Two general categories of interconnect options are available depending on your preferences and environment:

- **RJ-45 Patch Panel interconnects** collect Ethernet signals from each server blade and provide an external RJ-45 connector for cabling to each individual server blade NIC. The RJ-45 patch panel 2 option enables individual sever blade FC signals to pass through the interconnect. Benefits of the RJ-45 Patch Panel options include:
  - Connects signals directly to your LAN and SAN
  - Offers the lowest blade solution price
  - Requires no software or management
  - Provides FC signal pass-through (RJ-45 Patch Panel 2 only)
- **Interconnect Switches** consolidate the Ethernet signals from the server blades to a smaller set of external copper-based or fiber-based uplink ports for connection to your network. Similar to the RJ-45 Patch Panel 2, select interconnect switch options pass through individual FC signals. Benefits of the interconnect switch options include:
  - Reduces the number of network cables needed for each server blade enclosure
  - Reduces the number of ports used on core network switches
  - Enables fully manageable and configurable interconnects
  - Provides FC signal pass-through (GbE2 Interconnect and Cisco Gigabit Ethernet Switches only)

The four specific HP BladeSystem p-Class interconnect options are shown in Table 9.

Table 9. HP BladeSystem p-Class interconnect options

Interconnect Option	FC Pass Through
Cisco Gigabit Ethernet Switch Module for HP BladeSystem p-Class	Yes
HP BladeSystem p-Class GbE2 Interconnect Switch	Yes
HP BladeSystem p-Class GbE Interconnect Switch	No
HP BladeSystem p-Class RJ-45 Patch Panel	No
HP BladeSystem p-Class RJ-45 Patch Panel 2	Yes

### Cisco Gigabit Ethernet Switch Module for HP BladeSystem p-Class

The CGESM is a 24-port Gigabit Ethernet Switch that significantly reduces the number of Ethernet network cables needed for each server blade enclosure. It is designed for applications that require Gigabit Ethernet network adapter consolidation to 1000 MB/s, advanced network functionality, and FC signal pass-through for server blades that use internal FC adapter options.

Figure 16 CGESM components

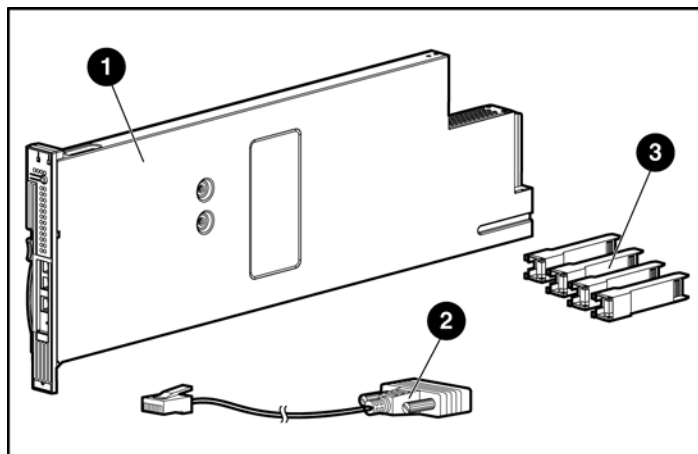


Table 10. GbE2 Interconnect Switch Components

Item	Description
1	CGESM Switch
2	SAN (OctalFC) interconnect module (optional) for FC pass-through
3	SFP connector for copper and FC Ethernet

CGESM kit options include the following:

- A hot-plug fully managed, layer 2+ CGESM and two Copper Small Form Factor Pluggable (SFP) modules with RJ-45 connectors
- A CGESM module with no SFPs

An optional kit to support Fiber SFPs is also available for Fiber gigabit Ethernet connectivity.

Each CGESM reduces up to 16 internal server blade network NIC ports to six external Ethernet ports. Because each external Ethernet port can communicate to all the server blades, as few as one external port per enclosure may be used to connect to your network.

In addition to providing up to 32-to-1 network cable reduction per server blade enclosure, the CGESM kit offers the following features:

- Cisco IOS based on Catalyst 2970 Enhanced Image.
- Gigabit Ethernet performance on all switch ports.
- Advanced network feature support and system availability including spanning tree per VLAN, 9k jumbo frames, RADIUS/TACAS+, IGMP Snooping, QoS, Link Aggregation Control Protocol (LACP), redundant syslog servers, redundant operating system firmware images and configuration files in memory.

For more detailed information about the specific set of features supported on this interconnect option, refer to the interconnect website, <http://www.hp.com/go/bladeSystem/interconnects/>

### ProLiant BL p-Class GbE2 Interconnect Switch

The ProLiant BL p-Class GbE2 Interconnect Switch is a 24-port Gigabit Ethernet Switch that significantly reduces the number of Ethernet network cables needed for each server blade enclosure and is designed for applications that require network adapter consolidation to 1000 Mb/s (Gigabit Ethernet), advanced network functionality, and FC signal pass-through for server blades that use internal FC adapter options.

Figure 17. GbE2 Interconnect Switch components

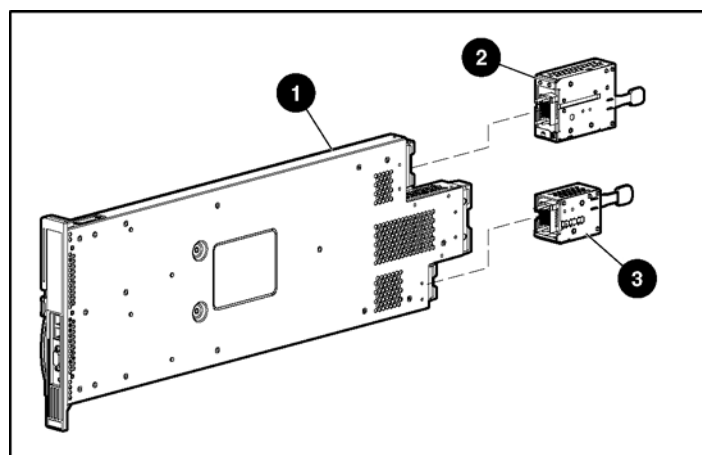


Table 11. GbE2 Interconnect Switch Components

Item	Description
1	GbE2 Interconnect Switch
2	SAN (OctalFC) interconnect module (optional) for pass-through of FC
3	GbE2 LAN interconnect module (for Ethernet signal consolidation)

The GbE2 Interconnect Kit contains two hot-plug, fully managed, layer 2 GbE2 Interconnect Switches and two LAN interconnect modules. The GbE2 Interconnect Kit is available with either copper-based (CgbE) or fiber-based (FgbE) uplinks.

Each GbE2 Interconnect Switch reduces up to 16 internal server blade network NICs ports to six external Ethernet ports. Because each external Ethernet port can communicate to all the server blades, as few as one external ports (per enclosure) may be used to connect to your network.

In addition to providing up to 32-to-1 network cable reduction per server blade enclosure, the GbE2 Interconnect Kit offers the following features:

- Gigabit Ethernet performance on all switch ports.
- Advanced network feature support and system availability including spanning tree per VLAN, 9k jumbo frames, RADIUS, redundant syslog servers, redundant operating system firmware images and configuration files in memory.
- Optional pass-through of FC signals for server blades configured with internal FC adapter options.

For more detailed information about the specific set of features supported on this switch, refer to the interconnect website, <http://www.hp.com/go/bladesystem/interconnects/>

### **ProLiant BL p-Class GbE Interconnect Switch**

The ProLiant BL p-Class GbE Interconnect Kit reduces the number of network cables needed for each server blade enclosure and consolidates the server blade network adapter signals to 100 Mb/s.

The GbE Interconnect Kit includes two hot-plug, fully managed layer 2 Ethernet switches and two rear-mounted, 4-port LAN interconnect modules. The GbE Interconnect Kit is available with either copper-based (C-GbE) or fiber-based (F-GbE) uplinks.

Figure 18. GbE Interconnect Switch components

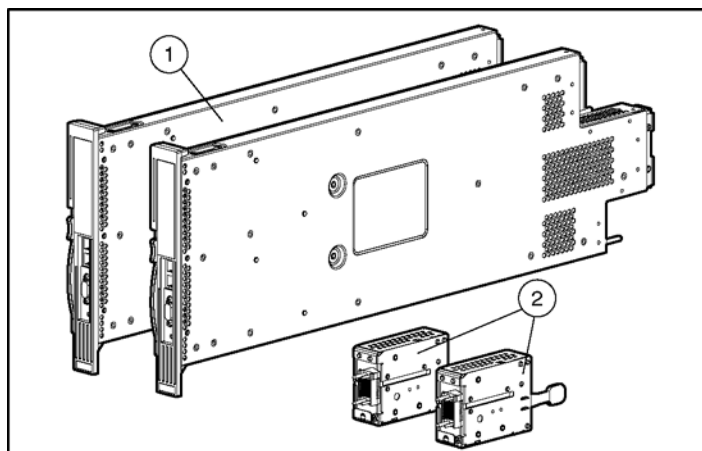


Table 12. GbE Interconnect Switch Components

Item	Description
1	GbE Interconnect Switch
2	GbE LAN Interconnect Module

In addition to providing up to 32 FC to 1GB network cable reduction per server blade enclosure, the GbE Interconnect kit offers the following features:

- DLink Switch OS.
- Gigabit Ethernet performance on two uplink switch ports.
- Advanced network feature support and system availability, including QoS, IGMP, and MAC-based priority.

For more detailed information about the specific set of features supported on this switch, refer to the HP BladeSystem interconnect website, <http://www.hp.com/go/bladeSystem/interconnects/>



## ProLiant BL p-Class RJ-45 Patch Panel

The RJ-45 Patch Panel brings all server blade NIC signals out as individual RJ-45 connectors.

Figure 19. RJ-45 Patch Panel components

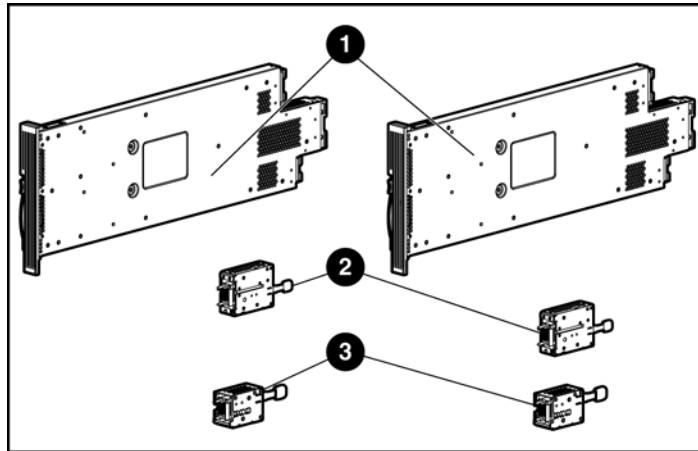


Table 13. RJ-45 Patch Panel Components

Item	Description
1	RJ-45 Patch Panels
2	RJ-45 Interconnect Module (10-connector)
3	RJ-45 Interconnect Module (6-connector)

Features of the RJ-45 Patch panel include:

- Economical solution for providing pass through of up to 32 NIC signals
- Completely passive—requires no software or management
- Fault tolerance—Half of the signals from each server blade go to the left interconnect and half go to the right interconnect, providing separate redundant paths to the network(s).

## ProLiant BL p-Class RJ-45 Patch Panel 2

The RJ-45 Patch Panel 2 functions as an Ethernet pass-through and enables pass-through functionality for FC signals from all server blades configured with internal FC adapter options.

Figure 20. RJ-45 Patch Panel 2 components

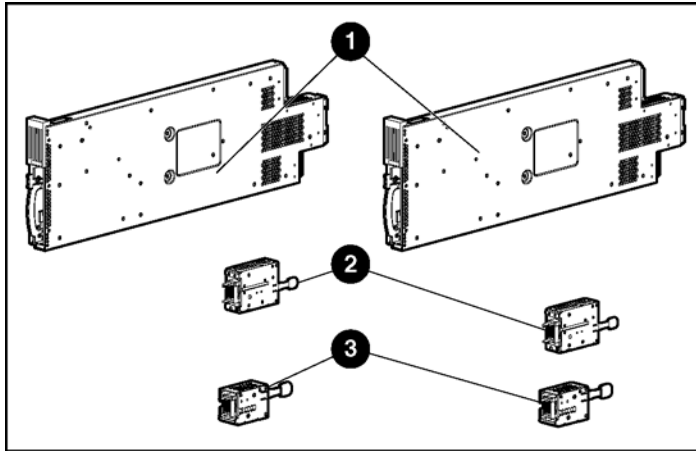


Table 14. RJ-45 Patch Panel 2 Components

Item	Description
1	RJ-45 Patch Panel 2
2	Patch Panel 2 Interconnect Module (10-connector)
3	Patch Panel 2 Interconnect Module (6-connector)

Each RJ-45 Patch Panel 2 Interconnect (a pair is included in each option kit) has eight FC SFF transceiver slots located on the front. Features of the RJ-45 Patch Panel 2 include:

- Economical solution for providing pass through of up to 32 NIC and 32 FC signals.
- Completely passive—requires no software or management.
- Fault tolerance—Half of the signals from each server blade go to the left interconnect and half go to the right interconnect, providing separate, redundant paths to the network(s).
- A cable channel facilitates routing the optical cables to the back of the server blade enclosure.
- Each dual port FC adapter option includes two SFF transceivers with LC connectors. These optical transceivers are universal and are installed in the front-panel transceiver slots located on the front of the RJ-45 Patch Panel 2.

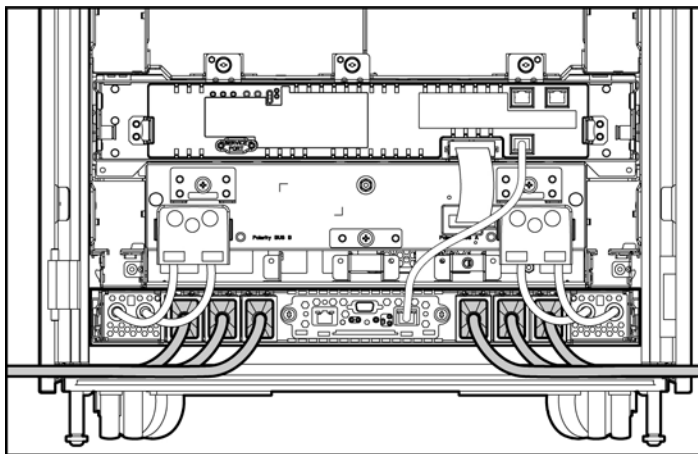
# HP BladeSystem p-Class power subsystem

HP provides two power subsystem alternatives to accommodate various environments and customer needs. These two options are enclosure-based power and rack-centralized power. All server blades, interconnect options, and management tools are fully compatible with either power subsystem.

## Enclosure-based power

The new HP BladeSystem p-Class 1U Power Enclosure provides hot-plug, fully redundant power for a single server blade enclosure containing any mix of server blades and interconnects. This option is ideal for small blade deployments such as in remote or branch offices or small and mid-size businesses.

Figure 21. HP BladeSystem 1U Power Enclosure



## Rack-centralized power

The HP BladeSystem p-Class 3U power subsystem provides hot-plug, fully redundant power for multiple enclosures that would typically be deployed in racks in a datacenter environment. Rack-centralized power provides an efficient way to support a large number of blades while eliminating power cables and the clutter and cost of PDUs associated with traditional power schemes. The 3U rack-centralized power subsystem includes the power supplies, 3U power enclosure, and a power distribution option. The HP BladeSystem p-Class system can be powered from single-phase or three-phase AC power or from -48 VDC power sources.

### Power supplies

The power supplies for the 3U solution convert 200–240 VAC to -48 VDC to power server blades and interconnect switches and are housed in a 3U power enclosure. The power supplies are front-accessible, hot-pluggable, and can be configured redundantly. The power enclosures are rack-mounted below the server blade enclosures that they support.

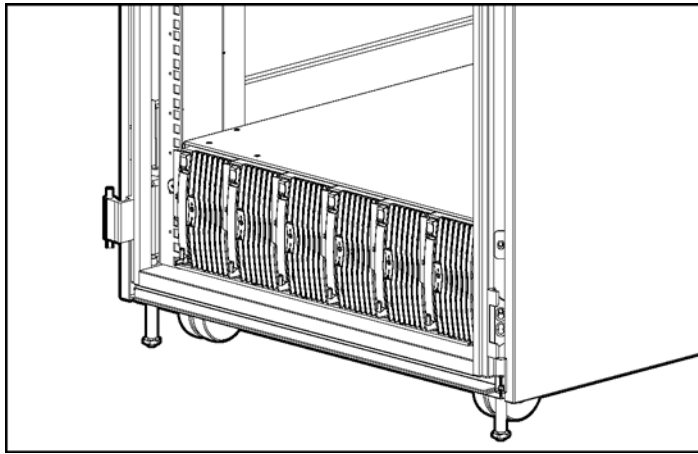
HP offers two models of 3U power enclosure that are designed to meet installation power demand and redundancy requirements, depending on the number and type of server blades you plan to deploy:

- Single-phase HP BladeSystem 3U p-Class Power Enclosure (holds up to four power supplies)
- Three-phase HP BladeSystem 3U p-Class Power Enclosure (holds up to six power supplies)

Because the three-phase power enclosure holds up to six power supplies, it supports more server blades and interconnect switches than the single-phase power enclosure. It is generally recommended for the HP BladeSystem p-Class solution. For more detailed information about the specific power enclosure options and power planning tools, refer to the HP BladeSystem p-Class website:

<http://www.hp.com/go/bladeSystem>

Figure 22. HP BladeSystem p-Class 3U Power Enclosure (three phase shown) with power supplies



### Power distribution

Power is carried from the power supplies in the power enclosure(s) or from the local –48V facility DC power source to the server blade enclosures through either bus bars or a bus box. Bus bars are used to support multi-enclosure deployments while the bus box is used to power a single server blade enclosure, such as in a lab or test system environment.

The bus bars are attached directly to the RETMA rails in a rack. Hinges on the bus bars provide easy rear access to the interconnect modules, network cables, server blade management modules, and power management modules.

The three specific HP BladeSystem p-Class power distribution options are summarized in Table 14.

Deploying a full 42U rack of ProLiant BL p-Class server blades requires using two pairs of mini bus bars.

Table 15. HP BladeSystem p-Class Power Distribution Options

Solution	Power Enclosures Supported	Server Blade Enclosures Supported	Maximum Rack Space Occupied
Scalable bus bar	2	5	36U
Mini bus bar	2 <sup>1</sup>	3	24U <sup>2</sup>
Power bus box	1	1	9U

1. To attach two power enclosures to a mini bus bar, the Dual Power Input Kit for Mini Bus Bar option is required.

2. To deploy a full 42U rack of HP BladeSystem p-Class server blades requires stacking two pairs of mini bus bars.

**NOTE:** When using an Enhanced Server Blade Enclosure, two power enclosures are required for power redundancy.

For more detailed information about the specific power distribution options and power planning tools, refer to the HP BladeSystem website at <http://www.hp.com/go/bladeSystem>

Figure 23. Scalable and mini bus bars

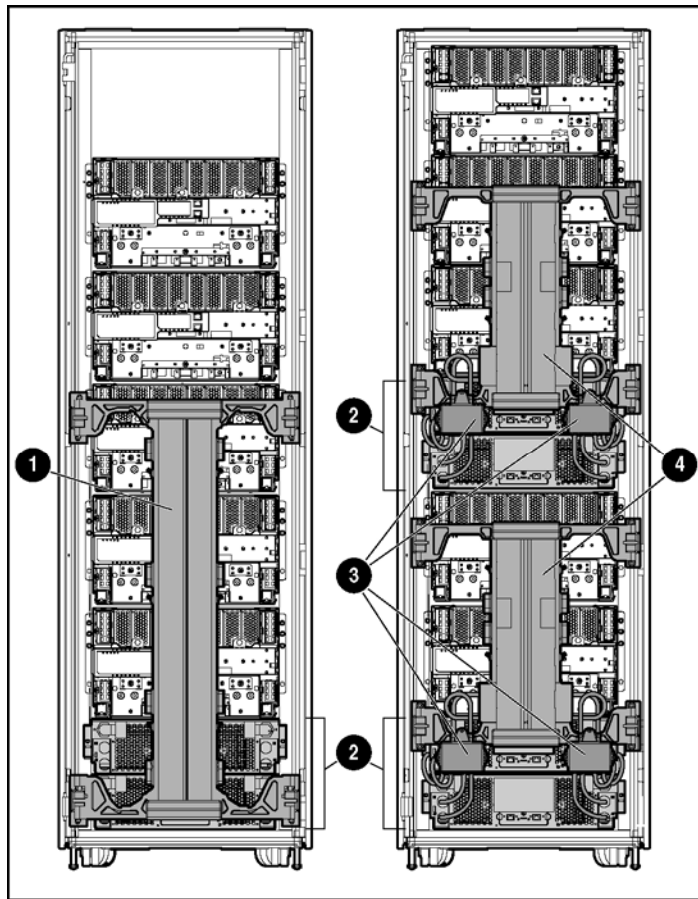


Table 16. Scalable and Mini Bus Bars

Item	Description
1	Scalable bus bars
2	3U power enclosures
3	Dual Power Input Kit for Mini Bus Bar
4	Mini bus bars

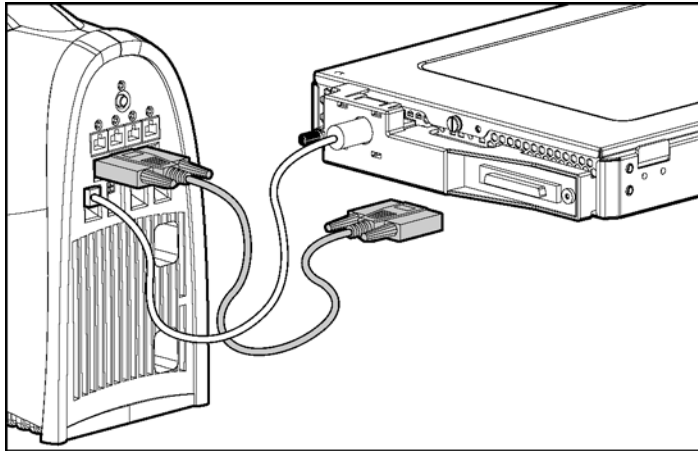
## HP BladeSystem p-Class 1U and 3U power subsystem features

- Availability—high availability, fully redundant configurations, including hot-plug redundant power supplies, redundant AC inputs, and a hot-plug power management module that operates independently of the server blades and interconnects  
In the 3U power subsystem, DC circuit breakers enable shutting off the power to individual server blade enclosures for safe physical access without interrupting the operation of other blade enclosures.
- Intelligent infrastructure— The hot-plug power management module monitors the power subsystem components and regulates the power-up sequence of newly installed server blades and interconnects switches. The power management module is cabled to the server blade enclosure management module(s) to facilitate communication of management information, such as server blade and interconnect location, power supply budget, and health status.
- Investment protection—All current and future server blades and interconnect options can be used with any of the power subsystem options.
- Toolless installation and serviceability—power enclosures are easily installed with spring-loaded rack rails and thumbscrews.

## HP BladeSystem p-Class Diagnostic Station

The HP BladeSystem p-Class Diagnostic Station enables a server blade or interconnect switch to be powered up outside of a server blade enclosure for testing or diagnostic purposes. The diagnostic station contains a power supply and connectors for data transfer between the server blade or interconnect switch and a client device (such as a PC, notebook, or workstation). The client provides the keyboard, video, mouse, and diskette interface and facilitates the use of the iLO remote console.

Figure 24. Diagnostic Station



The diagnostic station enables the following tasks to be performed outside of a server blade enclosure:

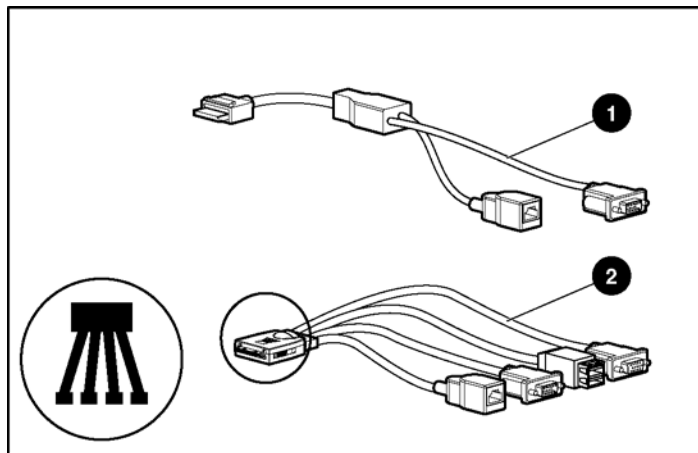
- Power up a server blade or interconnect switch
- Observe external LEDs
- Test NIC and interconnect switch port activity
- Configure a server blade
- Configure an interconnect switch, including VLANs and security
- Load software on a server blade
- Configure an interconnect switch to download an applicable configuration file
- Test a server blade or interconnect switch after installing an option or upgrade
- Diagnose a server blade using iLO
- Diagnose the interconnect switch using the front panel Ethernet and RS-232 ports

## HP BladeSystem p-Class diagnostic and local I/O cables

HP BladeSystem p-Class systems are optimized for use with HP ProLiant Essentials Rapid Deployment pack (RDP) for software installation and deployment from a centralized deployment console. Local console and I/O connections are available through diagnostic and local I/O cables.

- Diagnostic cable—A diagnostic connector is on the front of the some server blade models. This connector is used to access the iLO of a server blade by connecting a client device directly to the server blade.
- Local I/O cable—A local I/O cable can be used with server blade models that have an I/O cable icon next to the I/O port on the front of the server blade. The I/O connector provides ports for video, up to two USB devices, kernel debug, serial, and iLO Ethernet connectivity.

Figure 25. Diagnostic and Local I/O Cables and I/O cable Icon



Refer to the documentation that shipped with your server blade for more information on the use of the diagnostic or local I/O cable.



## HP BladeSystem Management Software overview

HP highly recommends that you become familiar with the tools shown in Table 17, which are used to set up, configure, and manage the HP BladeSystem solution. This table serves as a getting started checklist and as a pointer to more information about these tools.

Table 17: Key Management Components

Tool	Function	Where to Find
SmartStart software	SmartStart software is used to initialize and configure one or more management servers that make up the HP BladeSystem management environment.  For more information, refer to <a href="http://www.hp.com/servers/smartstart/">http://www.hp.com/servers/smartstart/</a>	Located in the HP ProLiant Essentials Foundation Pack shipped with each HP BladeSystem blade enclosure
HP ProLiant Essentials RDP	RDP is used to automate the process of deploying and provisioning server blade software and interconnect switch configuration. This enables management of multiple server blades and interconnects, and facilitates the development of pre-tested server builds and interconnect configurations.  For more information, refer to <a href="http://www.hp.com/servers/rdp/">http://www.hp.com/servers/rdp/</a>	Optional product shipped with HP BladeSystem enclosures, or available for download at the RDP website.  A license fee is required for use of this product.
HP Systems Insight Manager (HP SIM)	For more information, refer to <a href="http://www.hp.com/go/hpsim/">http://www.hp.com/go/hpsim/</a>	Located in the HP ProLiant Essentials Foundation Pack, shipped with HP BladeSystem enclosures.
Integrated Lights-Out (iLO)	For ProLiant BL p-Class server blades, iLO provides advanced levels of remote manageability. This guide details iLO functions in various steps of initial configuration, as well as for common operational tasks. For more information, refer to <a href="http://www.hp.com/servers/ilo/">http://www.hp.com/servers/ilo/</a>	Standard with ProLiant BL p-Class server blades.
Array Configuration Utility (ACU)	ACU is used to set up local drive controllers and RAID environments for ProLiant BL20p, BL25p, BL40p, and BL45p Server Blades.  ACU is also used with the HP StorageWorks Modular SAN Array 1000 (MSA1000) storage system to set up the SAN drive controller, RAID environment, and logical drives for connection to ProLiant BL server blades.  This guide provides instructions for the use of this tool during initial server setup and ProLiant BL system SAN setup.	Located in the HP ProLiant Essentials Foundation Pack, shipped with HP BladeSystem enclosures.  Available for download at <a href="http://h18004.www1.hp.com/products/servers/proliantstorage/software/management/acumatrix/">http://h18004.www1.hp.com/products/servers/proliantstorage/software/management/acumatrix/</a>

*Continued...*

Table 17: Key Management Components (*continued*)

Tool	Function	Where to Find
HP BladeSystem Interconnect Switch configuration and management software	ProLiant BL Interconnect Switches provide both command line and Web-based interfaces for configuration and management of interconnect switches within server blade enclosures. For more information, refer to:  HP BladeSystem p-Class GbE and GbE2 Interconnect Switches at <a href="http://h18004.www1.hp.com/products/servers/proliant-bl/p-class/20p/bl-p-interconnect-switch.html">http://h18004.www1.hp.com/products/servers/proliant-bl/p-class/20p/bl-p-interconnect-switch.html</a>	Ships with HP BladeSystem p-Class Interconnect Switch Kits.
F5 Networks Big-IP Blade Controller software	The F5 Big-IP Blade Controller software provides load balancing and L3-7 traffic management functions for the ProLiant BL system environment. The software, once installed on a server blade, converts the server blade into an F5 Big-IP appliance. The <i>HP BladeSystem System Common Procedures Guide</i> provides setup instructions and uses the F5 software in several common operational tasks.	Optional software available from F5 Networks, Inc., at <a href="http://www.f5.com">http://www.f5.com</a>  A license from F5 Networks is required.

## HP BladeSystem p-Class operating system installation options

The operating system for a server blade may be deployed using one of the following options:

- RDP for installation of the operating system on one or many blades simultaneously from a centralized deployment console
- iLO with Advanced Pack features enables installation of an operating system using the iLO remote console and virtual floppy or virtual CD-ROM features
- Directly cable KVM and removable media devices to a server blade using the local I/O cable (not supported on all server blade models.)

## Operating system support

For the most current versions of operating systems supported on the HP BladeSystem p-Class solution, visit <http://www.hp.com/go/ossupport>

## HP ProLiant Essentials Rapid Deployment Pack

RDP provides a remote console-based method for scalable, automated server deployment without network degradation. RDP can be used to deploy from up to 100 server blades in 30 minutes. In addition, RDP for Windows (version 1.40 or later) includes the added ability to identify and deploy interconnect switches.

RDP maximizes IT resources by providing a full server build from a remote console for initial power on, automated server configuration on the fly, and installation of standard software sets based on server roles. The intuitive interface reduces the level of IT skill sets needed to deploy and redeploy ProLiant BL servers in the data center and throughout the network.

RDP features industry-standard PXE technology and multicasting technology. RDP also includes a modular set of DOS-based utilities for automating many steps in the configuration process, and it provides sample scripts for configuring server blades. A Linux edition of RDP is available and requires an additional management server. Network File System (NFS) is required if performing a Linux scripted installation.

All server blades have PXE-enabled NICs. The RDP enables administrators to create a configuration script, or "server profile," for target server blades by copying and editing files of a configured source server or server blade. Administrators can then copy that configuration script and Scripting Toolkit utilities to a network share or a bootable server configuration diskette. By combining scripts for server configuration and OS installation, IT administrators can rapidly configure a new server or server blade and install the OS remotely. This remote process shrinks a typical installation time from hours or days to minutes, making it possible to scale server blade deployments to high volumes rapidly.

RDP also enables server blade "rip-and-replace" functionality. An administrator can use RDP to pre-assign a particular server profile to each server blade bay in a server blade enclosure.

For example, in order for a ProLiant BL20p G3 Server Blade in server blade bay 4 to run Microsoft Windows 2000 with Microsoft Internet Information Server (IIS) and some HTML scripting, the administrator simply builds that server profile for bay 4 and loads the image onto a deployment server. When a new server blade is installed into bay 4, the server blade seeks out the deployment server, downloads the pre-assigned script, and begins working immediately without intervention. If that server blade requires replacement, the new server blade automatically seeks out the deployment server and downloads the pre-assigned script to configure itself identically. In other words, the new server blade automatically takes on the role of the previous server blade, significantly reducing the time and effort needed to keep servers in production.

For more information on HP ProLiant Essentials RDP, refer to <http://www.hp.com/servers/rdp/>

## HP Systems Insight Manager

HP SIM helps reduce incidence of unplanned server downtime and maximizes IT staff efficiency by providing centralized fault, inventory, and configuration management for your ProLiant BL servers. HP SIM will automatically discover and draw a visual representation of HP BladeSystem enclosures and servers. It associates server blades with the appropriate enclosure and displays health status for each blade. Users can drill down for further information such as system events or detailed system inventory and can access onboard management such as the System Management Home Page and the iLO management processor. Through automated event handling, systems administrators can ensure proactive delivery of system alerts so that component failures or environmental problems do not result in unplanned server downtime.

HP SIM also helps keep blade BIOS, drivers, and agents up to date through system software version control. HP SIM will automatically download the latest firmware components from the HP website and identify systems that require updates, either by comparing target servers to a customer-defined system software baseline or to the latest software published by HP. Users can then deploy single components or collections of components to groups of systems using the "Install Software and Firmware" task.

In addition, HP SIM can manage ProLiant DL and ML servers, HP client systems, printers, storage, and other devices. It also serves as the central launching point for other management capabilities. It discovers the iLO management processor and Remote Insight Lights-Out Edition (RiLOE) card, associates them with their host server, and launches their user interface from the device list. It can also perform an in-context launch of tools such as the HP ProLiant Essentials Performance Management Pack, HP WebJetAdmin, and HP Client Manager Software.

For more information on HP SIM, visit the HP website at <http://www.hp.com/go/hpsim>

## Integrated Lights-Out Advanced Edition

iLO Advanced Edition is included with each HP BladeSystem p-Class server blade. iLO Advanced Edition is a LAN-only, cost-effective method of enabling authorized IT personnel to have full access and control of the system from any location, independent of the state of the server blade operating system or server blade hardware.

iLO Advanced Edition incorporates functionality in its firmware to support the modular architecture of the HP BladeSystem, making it easier to deploy and manage. Because each server blade contains iLO Advanced Edition, it can query and control important aspects of its server blade environment, such as the power allocation mechanisms. Because of its localized intelligence, dedicated management network, and direct connection to the management console, iLO Advanced Edition provides the intelligent communication channels to send alerts and other management information throughout the management infrastructure. In addition to full graphical access to the display, keyboard, and mouse of the host server, the advanced functionality also includes virtual media (diskette and CD-ROM).

For more information on iLO Advanced Edition, refer to <http://www.hp.com/servers/ilo/>

## Smart Array RAID controllers

The Smart Array 6i Controller is a hardware-based, cost-effective RAID solution used in the ProLiant BL20p G3, ProLiant BL25p, and ProLiant BL45p Server Blades. The Smart Array 6i Controller is an intelligent array controller for entry-level, hardware-based fault tolerance with support for Ultra3 SCSI technology and an improved data transfer rate maximum of 160 MB/s per channel. Embedded into the server blade, the Smart Array 6i Controller provides worry-free data protection for all server blade internal storage needs. The Smart Array 5i Controller is the RAID solution used in the ProLiant BL40p Server Blade.

ProLiant BL20p G3, ProLiant BL25p, ProLiant BL40p, and ProLiant BL45p Server Blades support drive mirroring (RAID 1) and drive striping (RAID 0). In addition, the ProLiant BL40p Server Blade supports RAID 5. The ProLiant BL20p G3, ProLiant BL25p, ProLiant BL40p, and ProLiant BL45p Server Blades also offer a Battery-Backed Write Cache option to prevent data loss during power interruptions.

For more information on the Smart Array 6i Controller, refer to <http://h18006.www1.hp.com/products/servers/proliantstorage/arraycontrollers>

## HP BladeSystem p-Class Interconnect Switch Management

The HP BladeSystem p-Class GbE and GbE2 Interconnect Switches are industry-standard managed Ethernet switches that customers configure and manage in the same manner as other industry-standard Ethernet switches. To aid users during initial deployment, the interconnect switch includes a default configuration that is fully operational at initial boot.

A web browser-based interface and a command line interface with scripting capability are pre-installed in the switch firmware to configure, manage, and monitor the interconnect switches. Telnet access is also supported. Any combination of the switch ports can be disabled, enabled, configured, and monitored on a per port basis. Out-of-band and in-band access to the switch management interfaces is supported locally and remotely from anywhere on the network. Administration of the pair of interconnect switches in the server blade enclosure is possible through any uplink port, the serial port, or the two Ethernet ports conveniently located on the front panel of each switch.

The interconnect switch supports industry-standard SNMP management information bases (MIBs), HP enterprise switch MIBs, and environmental traps. The SNMP agents are pre-installed in the interconnect switch firmware. This capability allows the interconnect switch to be monitored remotely from an SNMP network management station such as HP SIM and HP OpenView. The interconnect switch may also be configured through the HP OpenView Network Node Manager.

For rapid deployment from one-to-many interconnect switches, RDP for Windows includes server-side scripting. With server-side scripting, interconnect switch scripts can be integrated in an RDP for Windows job for deployment of both server blade and switches. This is ideal for using RDP for Windows to deploy a server blade and then configure associated switch VLANs, although any scriptable interconnect switch parameter can be integrated.

The interconnect switch supports trivial file transfer protocol (TFTP) allowing a copy of the interconnect switch configuration file to be saved and downloaded either to the original switch or to a different interconnect switch. This provides another method to rapidly deploy multiple systems with similar configurations and to provide backup and restore capabilities. Configuration settings may be modified through the user interfaces or directly within the configuration file. The configuration file has a text-based format, which allows it to be directly viewed, printed, and edited.

Users with Windows or Linux-based deployment stations can perform interconnect switch firmware upgrades by using TFTP through the Ethernet port after boot-up, and by using ZModem (for GbE Interconnect Switch) or XModem (for GbE2 Interconnect Switch) through the serial interface during boot-up. The interconnect switch simplifies system upgrades by retaining its configuration after a firmware upgrade and by supporting the HP Support Paq automated firmware upgrade process for Windows deployment stations.

For more information about HP BladeSystem p-Class Interconnect Switches, refer to <http://h18000.www1.hp.com/products/servers/proliant-bl/p-class/bl-p-interconnect-switch.html>

# Planning for a HP BladeSystem p-Class installation

The HP BladeSystem p-Class Sizing Utility is a free, flexible, graphical tool that provides valuable information necessary to help plan and prepare a site for delivery and installation of HP BladeSystem p-Class solutions and order the necessary components for the installation. Site planning information, such as power requirements and environmental specifications, is generated based on user-defined system configuration criteria. Simply configure each server blade and blade enclosure with appropriate options, choose interconnects for each server blade enclosure, and enter data center power information.

## HP BladeSystem p-Class Sizing Utility

Figure 26. HP BladeSystem p-Class Sizing Utility

Configure Individual Blade

BL20p G2

SKU#: ONE Xeon 2.8GHz-512K, 512MB RAM (2 x 256MB), no drives, FC Mezz Card

C-GbE Interconnect Switch

Enclosure 6

C-GbE Interconnect Switch

	Bay 1	Bay 2	Bay 3	Bay 4	Bay 5
Type of Blade	BL20p G2	BL20p G2	BL20p	BL20p G2	BL40p
SKU #	2	1	1	4	2
# Processors	2	2	2	2	2
18 GB HDD(s)	0	0	0	0	1
36 GB HDD(s)	0	0	0	0	0
72 GB HDD(s)	0	0	2	0	0
146 GB HDD(s)	2	2	0	2	0
# of PCI's	N/A	N/A	N/A	N/A	2
Type of Mezzanine	Fibre Cho	Standard	GB Upgrd	Fibre Cho	N/A
256 MB	0	0	0	0	0
512 MB	0	0	0	0	0
1 GB	0	0	0	0	2
2 GB	0	2	0	4	0

Click here for Server Configuration Information

Click here for Power Summary

Click here for Equipment List (BOM)

Click here to Return to Main Interface

C-GbE Interconnect Switch

Once configuration information is entered, the tool calculates:

- Power specifications
- Heat generation and cooling requirements
- Summary table of server blade components in the rack (server blades, memory, processor, etc.)
- Number of power supplies and power enclosures needed for configuration entered
- System weight
- Equipment list (refer to Figure 27)

Figure 27. HP BladeSystem Equipment List Output Example

### Equipment List

This Equipment List can be copied to an excel worksheet or word document. To copy this table, select the table using the mouse. Copy the selected table using Copy command from the Edit menu. Go to the destination document and paste it.

Part Description	Qty	Part Number
ProLiant BL20p server blade with ONE Pentium III P1400-512K, 512MB RAM, no drives	4	230040-B21
ProLiant BL40p server blade with ONE Xeon MP1.5GHz-1MB Cache, 512MB RAM (2 x 256MB), no drives	1	293461-B21
ProLiant BL40p server blade with TWO Xeon MP2.0GHz-2MB Cache, 1GB RAM (2 x 512MB), no drives (Not available in NA)	4	293462-B21
ProLiant BL20P G2 server blade with ONE Xeon P2.8GHz, 512MB RAM (2 x 256MB), no drives	7	300876-B21
ProLiant BL20p G2 server blade with TWO Xeon P2.8GHz, 1GB RAM (2 x 512MB), no drives (Not available in NA)	8	300877-B21
ProLiant BL20P G2 server blade with ONE Xeon P2.8GHz, 512MB RAM (2 x 256MB), no drives, with FC Mezz Card	2	300980-B21
ProLiant BL20p G2 server blade with TWO Xeon P2.8GHz, 1GB RAM (2 x 512MB), no drives, with FC Mezz card (Not available in NA)	7	300981-B21
Additional 2 GB (2 x 1 GB) Memory Kit(s)	2	201695-B21
Additional DDR 512 MB (2 x 256 MB) Memory Kit(s)	6	300678-B21
Additional DDR 1 GB (2 x 512 MB) Memory Kit(s)	2	300679-B21
Additional DDR 2 GB (2 x 1 GB) Memory Kit(s)	8	300680-B21
Additional DDR 4 GB (2 x 2 GB) Memory Kit(s)	11	300682-B21
Additional Pentium III 1.4GHz	4	234277-B21
Additional Xeon MP 1.5 GHz	3	309330-B21

For more information about the HP BladeSystem p-Class Sizing Utility, refer to <http://www.hp.com/go/bladeSystem/sizingutility>

### Required input power

The HP BladeSystem p-Class 3U power subsystem has specific AC power requirements. However, DC power may be used instead if the facility has DC power available.

When using an AC power source, the HP BladeSystem requires single-phase (1U or 3U power enclosures) or three-phase (3U power enclosures) 200–240 VAC input power. The 3U power enclosure requires two 30 A power sources.

The capacity of an HP BladeSystem p-Class Power Supply varies with the voltage level of the local AC power source. Maximum capacity can only be achieved using a 240-V nominally rated power source. Lower voltages may result in lower server blade capacity. The HP BladeSystem p-Class Sizing Utility considers this. Refer to Figure 28 for the maximum output power capacity for various input voltages between 200–240 VAC.

Figure 28: Maximum output power capacity

NAIJP Power Enclosures										
80% Plug derating applied					Number of slots supported at X Watts per slot					
Power Enclosure Model	Number of Power Enclosures	Total Number of Power Supplies per Side	Nominal AC Input Line Voltage (Vac)	Total DC Pwr Available (W)	150	175	200	225	250	275
Single-phase	1	1	200-240	2,930	19	16	14	13	11	10
		2	200	3,998	26	22	19	17	15	14
		208	4,158	27	23	20	18	16	15	13
	2	2	200-240	5,860	39	33	29	26	23	21
		4	200	7,997	53	45	39	35	31	29
		208	8,317	55	47	41	36	33	30	27
Three-phase	1	3	200	6,925	46	39	34	30	27	25
			208	7,202	48	41	36	32	28	26
	2	6	200	13,851	60+	60+	60+	60+	55	50
			208	14,405	60+	60+	60+	60+	57	52

International Power Enclosures										
80% Plug derating applied					Number of slots supported at X Watts per slot					
Power Enclosure Model	Number of Power Enclosures	Total Number of Power Supplies per Side	Nominal AC Input Line Voltage (Vac)	Total DC Pwr Available (W)	150	175	200	225	250	275
Single-phase	1	1	200-240	2,930	19	16	14	13	11	10
		2	220	4,398	29	25	21	19	17	15
			230	4,598	30	26	22	20	18	16
			240	4,798	31	27	23	21	19	17
	2	2	200-240	5,860	39	33	29	26	23	21
		4	220	8,796	58	50	43	39	35	31
			230	9,196	60+	52	45	40	36	33
			240	9,596	60+	54	47	42	38	34
Three-phase	1	3	200-240	8,790	50+	50	43	39	35	31
	2	6	200-240	17,580	60+	60+	60+	60+	60+	58

Power Bus Box supports up to 10 slots	1-10
Mini-bus supports up to 30 slots with one Power Enclosure	11-30
Scalable supports up to 50 slots with one or two Power Enclosures	31-50
Though total is 30 slots or less, requires Scalable to support two Power Enclosures	X
Mini-bus x 2 supports up to 60 slots with two Power Enclosures, each connected to one bus	51-60
DC power greater than max required for 50 slots - Scalable with one or two Power Enclosures is max choice	50+
DC power greater than max required for 60 slots - Mini-bus x 2 with two Power Enclosures is max choice	60+

For more information about the HP BladeSystem p-Class Sizing Utility, refer to <http://www.hp.com/go/bladeSystem/sizingutility>

### Facility DC power connection

Facility DC power requires a Facility DC Power Connection Option Kit to distribute the current through the mini or scalable bus bars to the server blade enclosures. The HP BladeSystem p-Class system requires -48 VDC with no more than  $\pm 10\%$  voltage variance. If using facility DC power, power supplies and power enclosures are not needed for operation, because the DC Power Connection Option Kit provides power through a direct connection to the bus bars.

### Power phases and 3U power supply enclosures

The HP BladeSystem p-Class solution is designed for AC input power from either single-phase or three-phase power sources. Three-phase power supports maximum density configurations and is highly recommended.

Geography and number of AC phases dictate the appropriate model of 3U power enclosure for the data center. Each model of 3U power enclosure uses a different connector, as detailed in the following chart. Additionally, each 3U power enclosure requires two separate 30 A power feeds.



Figure 29. 3U power enclosure connectors



### AC connectors for the 3U power enclosure

Table 18 shows the four models of power enclosure connectors that are available.

Table 18. Power Enclosure Connectors and Compatibility

Item	Two Circuits/ Connectors	Model	Typical Electrical Service	Compatibility
1	L6-30	NA 1-phase (239162-001)	Single-phase 208 VAC	NEMA receptacles (NA/Japan)
2	L15-30	NA 3-phase (230769-001)	Three-phase delta 208 VAC	
3	3-pin (2-pole + ground)	Intl. 1-phase (230162-421)	Single-phase 230 VAC	IEC 309 pin & sleeve connectors (International)
4	5-pin (4-pole + ground)	Intl. 3-phase (230769-421)	Three-phase "Y" 380/415 VAC	

## Deployment considerations: HP BladeSystem p-Class network interconnects

The RJ-45 Patch Panel, RJ-45 Patch Panel 2, GbE Interconnect Switches, and GbE2 Interconnect Switches may be mixed within the rack, but not within the same server blade enclosure. The corresponding interconnect modules may also be mixed within the rack, but not within the same server blade enclosure.

### Deployment considerations: ProLiant BL p-Class RJ-45 Patch Panel and Patch Panel 2

When using the RJ-45 Patch Panel or RJ-45 Patch Panel 2 Interconnects, plan for cable egress according to Table 19.

Table 19. RJ-45 Patch Panel and RJ-45 Patch Panel 2 Cable Requirements

Server Blade Series	Maximum number of Network Cables per Blade
ProLiant BL20p, ProLiant BL25p, and ProLiant BL45p series	4 *
ProLiant BL30p and BL35p series	2 *
ProLiant BL40p series	6 *

As an alternative to using the interconnect switch options, a standard network switch can be mounted above the HP BladeSystem p-Class solution to concentrate cables coming from the server blades.

The RJ-45 Patch Panel and RJ-45 Patch Panel 2 have identical network cable requirements. However, with Patch Panel 2, two optical cables with LC connectors will be required for each ProLiant BL20p G3, ProLiant BL25p, or ProLiant BL45p Server Blade with the Dual Port FC Mezzanine Card installed on each **pair** of ProLiant BL30p or BL35p Server Blades each with the Dual-Port FC Adapter installed. LC-to-SC optical connector converters can be used if SC connectors are preferred.

**NOTE:** When using an enhanced server blade enclosure, the iLO NIC signals are routed to the sever blade management module and not to the interconnect module.

### Deployment considerations: ProLiant BL p-Class GbE2 Interconnect Switches

The C-GbE2 Interconnect Kit provides 12 10/100/1000T external Ethernet ports all with RJ-45 connectors; one to all twelve ports may be used. Therefore, plan to use a maximum of 12 CAT5 network cables per server blade enclosure.

The F-GbE2 Interconnect Kit provides four 10/100/1000 T/TX/T external Ethernet ports and eight 1000SX external Ethernet ports with LC connectors; one to all twelve ports may be used. Therefore, plan on one to four CAT5 (or better) network cables and one to eight optical network cables per server blade enclosure. LC-to-SC optical connector converters can be used if SC connectors are preferred.

**NOTE:** When using a server blade enclosure with enhanced backplane components, the iLO NIC signals are routed to the sever blade management module and not to the interconnect module.

The optional GbE2 Storage connectivity kit provides pass-through of ProLiant BL20p G3, ProLiant BL25p, ProLiant BL30p, BL35p, and ProLiant BL45p FC signals. This kit includes two OctalFC interconnect module connect modules, each with eight SFF slots. The SFF transceivers with LC connectors shipped with each BL20p G3, BL25p, or BL45p Dual Port FC Mezzanine Card are installed in the OctalFC SFF slots. Two optical cables with LC connectors will be required for each ProLiant BL20p G3, ProLiant BL25p, or ProLiant BL45p Server Blade with the Dual Port FC Mezzanine Card installed or each **pair** of ProLiant BL30p or ProLiant BL35p Server Blades with the Dual-Port FC Adapter installed. LC-to-SC optical connector converters can be used if SC connectors are preferred.

For more specific information on the ProLiant BL30p or ProLiant BL35p Server Blades and FC, see “Specific requirements for attaching ProLiant BL30p and ProLiant BL35p Server Blade to FC SANs” in this document.

Table 20 lists the Ethernet and FC cable requirements.

Table 20. Ethernet and FC Cable Requirements

Interconnect	Ethernet	FC
RJ-45 Patch Panel	1 to 3 cables per ProLiant BL20p G3, ProLiant BL25p, or ProLiant BL45p Server Blade 1 to 2 cables per ProLiant BL30p or ProLiant BL35p Server Blade 1 to 4 cables per ProLiant BL40p Server Blade 1 cable for the centralized server blade management module on enclosures with enhanced backplane components	N/A
RJ-45 Patch Panel 2	Same as RJ-45 Patch Panel	2 optical cables with LC connectors for each ProLiant BL20p G3 or ProLiant BL25p Server Blade with the Dual Port FC Mezzanine Card 2 optical cables with LC connectors for each pair of ProLiant BL30p or ProLiant BL35p Server Blades with the Dual-Port FC Adapter
C-GbE Interconnect Kit	1 to 12 cables per server blade enclosure 1 cable for the centralized server blade management module on enclosures with enhanced backplane components	N/A
F-GbE Interconnect Kit	1 to 4 optical cables with LC connectors per server blade enclosure 1 to 8 cables per server blade enclosure 1 cable for the centralized server blade management module on enclosures with enhanced backplane components	N/A
C-GbE2 Interconnect Kit	1 to 12 cables per server blade enclosure 1 cable for the centralized server blade management module on enclosures with enhanced backplane components	Requires Storage Connectivity Kit

*Continued...*

Table 20: Ethernet and FC Cable Requirements (*continued*)

Interconnect	Ethernet	FC
F-GbE2 Interconnect Kit	1 to 8 optical cables with LC connectors per server blade enclosure 1 to 4 cables per server blade enclosure 1 cable for the centralized server blade management module on enclosures with enhanced backplane components	Requires Storage Connectivity Kit
Storage Connectivity Kit	N/A	Same as RJ-45 Patch Panel 2

### Deployment considerations: ProLiant BL p-Class GbE Interconnect Switches

The C-GbE Interconnect Kit provides eight 10/100T and four 10/100/1000T external Ethernet ports all with RJ-45 connectors; one to twelve ports may be used. Therefore, plan on one to twelve network cables (CAT5 or better) per server blade enclosure.

The F-GbE Interconnect Kit provides eight 10/100T external Ethernet ports with RJ-45 connectors and four 1000SX external Ethernet ports with LC connectors; one to twelve ports may be used. Therefore, plan on one to eight network cables (CAT5 or better) and one to four optical network cables per server blade enclosure. LC-to-SC optical connector converters can be used if SC connectors are preferred.

## HP BladeSystem rack specifications

HP BladeSystem enclosures are designed to fit in the following HP ProLiant and third-party racks:

- HP ProLiant 10000 Series Racks (recommended)
- ProLiant 9000 Series Racks
- Telco racks (optional telco rack kit available)

Server blade enclosures fit in 6U of panel height in a standard 19-inch wide rack. The enclosure dimensions are:

- Height—26.7 cm (10.5 in)
- Width—44.5 cm (17.5 in)
- Depth— 71.8 cm (28.25 in) deep

The following minimum rack specifications should be considered when deploying server blade systems in third-party racks and cabinets:

- Compatible with 19-in Standard EIA rail sets
- EIA rail-to-rail depth is 73.66 to 76.20 cm (29 to 30 in)
- Cabinet depth must be at least 91.44 cm (36 in) deep overall [additional minimum 8.89 cm (3.5 in) clearance from rear RETMA rail to rear door, inclusive in the 91.44 cm (36 in) overall depth]
- Ample room for top and bottom cable egress [approximately 20.32 sq cm (8 sq in) for full rack configuration with the patch panel]
- Must be capable of supporting 725.75 kg (1600 lb) for full rack configuration
- Perforated front and rear doors to accommodate front-to-back cooling
- Must have 65% open perforation on server blade enclosure doors to support airflow requirements

## Server Blade Quantity

For site planning, the assumed quantity of server blades should be the total number of server blades that will be deployed over the life of the installation. Planning for growth is necessary to ensure that you purchase the appropriate power subsystem components (power enclosures and bus bars) and quantities of server blade enclosures. Additionally, growth sizing enables the pre-configuration of ample power to ensure that the HP BladeSystem can be expanded as your business grows.

If you mix server blades in a rack with traditional servers and storage, you should allow for space in the rack, weight, and power of additional devices.

## Configuring server blade options

For accurate site planning, server blade option entries should be the aggregate total number of all options to be installed in the server blades over the life of the installation. Options such as processors and hard drives can have a significant effect on power consumption, heat generation, and system weight.

For more information about the HP BladeSystem p-Class Sizing Utility, refer to <http://www.hp.com/go/bladesystem/sizingutility>

## HP BladeSystem server blade enclosures

The number of server blades determines the required quantity of enclosures. Each enclosure has ten slots; two of these are reserved for interconnects and eight are designated for server blades. Table 21 shows the capacity of a server blade enclosure:

Table 21. Capacity of server blade enclosure

Server Blade Series	Maximum Number of Server Blades per Enclosure
ProLiant BL20p and ProLiant BL25p series	8
ProLiant BL30p and ProLiant BL35p series	16
ProLiant BL40p series	2
ProLiant BL45p series	4

To plan for future growth, additional server blade enclosures can be installed in advance enabling rapid server deployments as needed. The HP BladeSystem p-Class Sizing Utility summary page indicates the appropriate number of enclosures and required power for the configuration specified by the customer in the tool.

For more information about the HP BladeSystem p-Class Sizing Utility, refer to <http://www.hp.com/go/bladesystem/sizingutility>

## 3U power distribution

The HP BladeSystem p-Class Sizing Utility suggests the optimum power distribution method for both redundant and non-redundant power configurations.

For more information about the HP BladeSystem p-Class Sizing Utility, refer to <http://www.hp.com/products/servers/proliant-bl/p-class/info>

## Site recommendations

The HP BladeSystem p-Class Sizing Utility provides environmental load estimates (total DC and AC power consumption, generated heat in BTU, weight and floor space requirements) based on the configuration. This information can be useful when planning and managing the data center environment.

For more information about the HP BladeSystem p-Class Sizing Utility, refer to

<http://www.hp.com/go/bladeSystem/sizingutility>

## Power requirements

The installation of this equipment shall be in accordance with local and regional electrical regulations governing the installation of information technology equipment by licensed electricians. This equipment is designed to operate in installations covered by NFPA 70, 1999 Edition (National Electric Code) and NFPA 75, 1992 Edition (code for Protection of Electronic Computer/Data Processing Equipment). For electrical power ratings on options, refer to the rating label of the product or the user documentation supplied with that option.

When installing the HP BladeSystem, observe the following guidelines:

- The power load must be balanced between available supply branch circuits.
- The overall system current load must not exceed 80 percent of the branch circuit current rating.

For DC systems, HP BladeSystem p-Class 3U rack-centralized solutions run on  $-48\text{ VDC} \pm 10\%$ . When power supplies are included in the HP BladeSystem p-Class solution, they require 230 VAC (International) or 208 VAC (US).

## Cooling and airflow

The server blades use front-to-back ambient air for cooling. Therefore, the front and rear rack doors must be adequately ventilated to allow ambient room air to enter the cabinet, and the rear door must be adequately ventilated to allow the warm air to escape from the cabinet.

When server blades or rack components do not fill the entire vertical space in the rack, the gaps between the components cause changes in airflow through the rack and across the server blades. Cover all gaps in the rack with blanking panels and fill all open bays in the server blade enclosure with blanks to maintain proper airflow. HP 10000 and Compaq 9000 Series Racks provide proper server blade cooling from flow-through perforations in the front and rear doors that provide 65% open area for ventilation.

## Total weight

Data on the dimensions and weights of HP BladeSystem p-Class components can be found in the *HP BladeSystem p-Class System Maintenance and Service Guide*. The same data can be determined by using the online HP BladeSystem p-Class Sizing Utility. In general, the raised floor must be capable of withstanding a uniform load of  $1,220\text{ kg/m}^2$  ( $250\text{ lb/ft}^2$ ) or a load of  $454\text{ kg}$  ( $1,000\text{ lb}$ ) on any  $6.5\text{ cm}^2$  ( $1.0\text{ in}^2$ ) surface, with a maximum deflection of  $2.5\text{ mm}$  ( $0.1\text{ in}$ ). For more information about the HP BladeSystem p-Class Sizing Utility, refer to <http://www.hp.com/go/bladeSystem/sizingutility>

## Total floor space

To enable servicing and adequate airflow, observe the following spatial requirements when deciding where to install an HP, Compaq, telco, or third-party rack:

- Leave a minimum clearance of 63.5 cm (25 in) in front of the rack.
- Leave a minimum clearance of 76.2 cm (30 in) in the back of the rack.
- Leave a minimum clearance of 121.9 cm (48 in) from the back of the rack to the rear of another rack or row of racks.

## System installation planning guides

When planning for an HP BladeSystem installation and setup, HP recommends that you reference the *HP BladeSystem System Common Procedures Guide* and *HP BladeSystem System Best Practices Guide*. These guides provide critical information, including the best practices, helpful hints, and suggestions for:

- Setting up and configuring an HP BladeSystem, including server blade enclosures, power subsystem, networks, server blades, and storage connectivity
- Setting up and configuring ProLiant tools needed for common system management tasks, such as deployment, configuration, and monitoring
- Planning and building the management environment
- Planning and building the blade system environment
  - Plan the HP BladeSystem environment
  - Building the HP BladeSystem infrastructure
  - Configuring the enclosure IP address
- Configuring the blade network environment
- Configure the switches and VLANs
- Setting up and configuring the SAN environment (optional)
- Setting up and configuring the first server blade
- Installing the operating system
- Installing and setting up additional server blades
- Configuring the connection for each server blade to SAN virtual drives (optional)

For more information on site planning, or to view the guides referenced in this topic, refer to the HP website,

<http://www.hp.com/go/bladeSystem>

## For more information

For more information on HP server blades, refer to the HP website,

<http://www.hp.com/go/bladeSystem/>

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